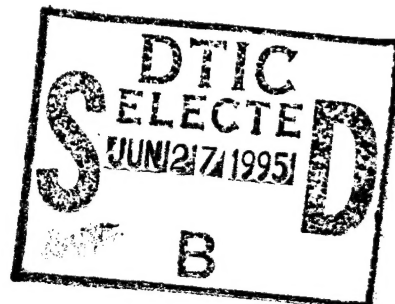


NAVAL BIODYNAMICS LABORATORY  
NBDL-95R003

**1994  
COMMAND HISTORY**

March 1995

NAVAL BIODYNAMICS LABORATORY  
P.O. Box 29407  
NEW ORLEANS, LA 70189-0407



Approved for public release; distribution is unlimited

Prepared for  
Naval Medical Research and Development Command  
Bethesda, MD 20889-5044

19950623 066

DTIC QUALITY INSPECTED 5

**Edited By:**

LT Danny W. Denton, MSC, USNR

**Editorial Assistant:**

SA Thelma L. Messina, USN

**Photography:**

Mr. Art Prell

**Approved and Released by:**

A handwritten signature in dark ink, appearing to read "R. W. Rendin", with a long horizontal flourish extending to the right.

**R. W. RENDIN**  
Commander, Medical Service Corps  
United States Navy  
Commanding Officer

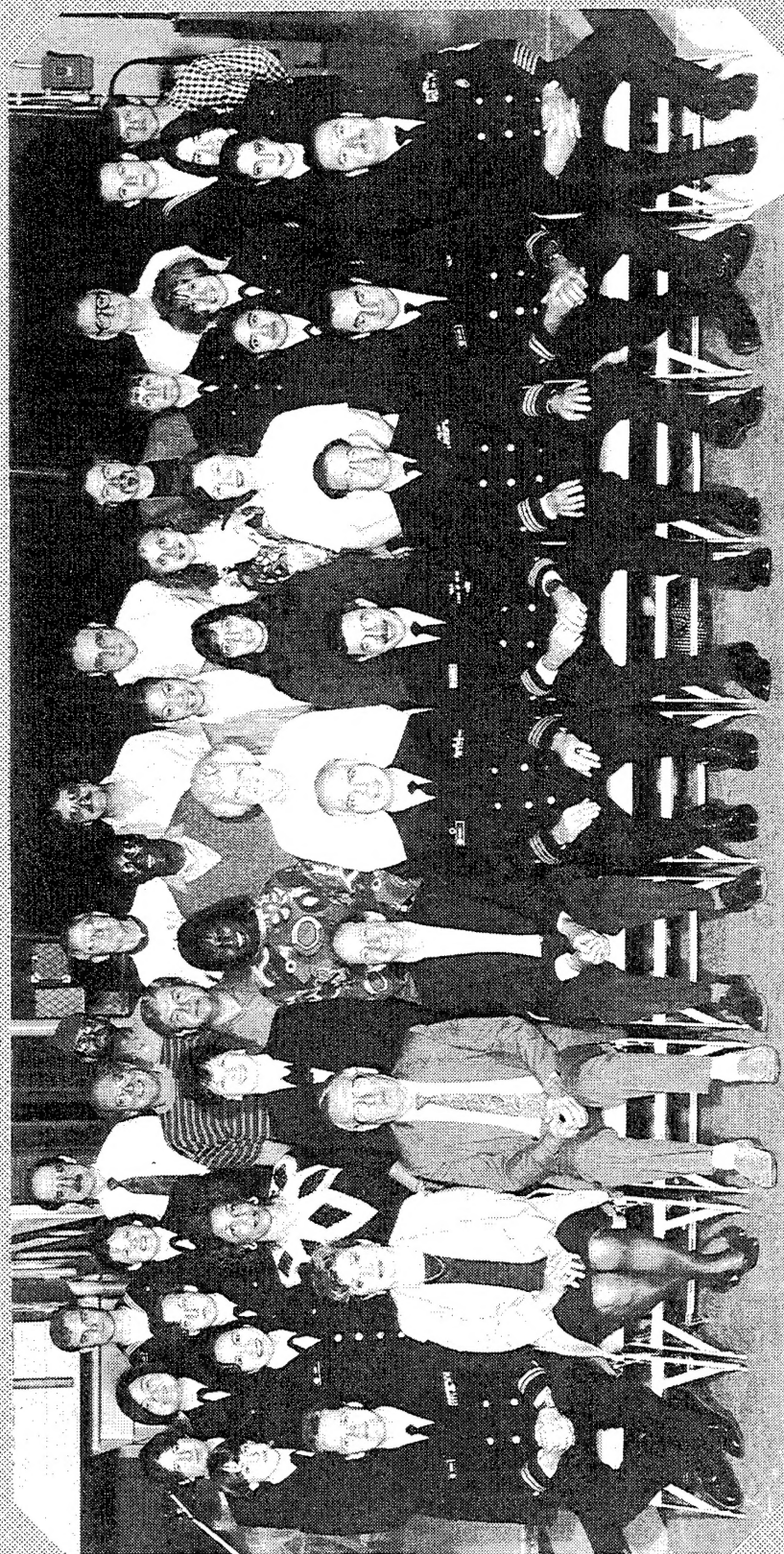
## **TABLE OF CONTENTS**

INTRODUCTION .....	1
NBDL MISSION, VISION, AND GUIDING PRINCIPLES .....	2
1994 TOTAL FUNDING/PERSONNEL STRENGTH .....	3
ORGANIZATION CHART .....	4
COMMANDING OFFICER .....	5-6
EXECUTIVE OFFICER, DEPARTMENT HEADS, AND COMMAND CHIEF .....	7-8
HUMAN RESEARCH VOLUNTEERS .....	9
FACILITIES .....	10-15
RESEARCH DEPARTMENT .....	16
MATHEMATICAL SCIENCES DIVISION .....	16-18
HUMAN FACTORS DIVISION .....	18-20
DATA SYSTEMS DIVISION .....	20
BIOMEDICAL SUPPORT DEPARTMENT .....	21
TECHNOLOGY DEPARTMENT .....	22
ENGINEERING DIVISION .....	22
BIOINSTRUMENTATION DIVISION .....	22-24
RESEARCH SUPPORT DEPARTMENT .....	25
FISCAL DEPARTMENT .....	26
SUPPLY DIVISION .....	26
PROFESSIONAL MEETINGS ATTENDED .....	27-29
PRESENTATIONS .....	30
PUBLICATIONS .....	31

DISTINGUISHED VISITORS .....	32-34
COMMUNITY SERVICE .....	35
NBDL PERSONNEL IN ACTION .....	36-37
MILITARY AWARDS .....	38-39
CIVILIAN AWARDS .....	40
MILITARY AND CIVILIAN REPORTING/DEPARTING .....	41
LCDR DOUGLAS HOLCOMBE'S RETIREMENT .....	42
TELEPHONE DIRECTORY .....	43

<b>Accession For</b>	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	





## INTRODUCTION

### *HISTORY*

The Naval Biodynamics Laboratory (NBDL) was established as the Naval Aerospace Medical Research Laboratory Detachment (NAMRLD) in April 1971 by the Bureau of Medicine and Surgery. NAMRLD was a detachment of the Naval Aerospace Medical Research Laboratory which is located at the Naval Air Station, Pensacola, Florida. The initial purpose of the Detachment was to study human response to impact acceleration. In 1975, the mission was expanded to include human response to vibration, ship motion, and human performance. NBDL was designated a separate command by the Secretary of the Navy in February, 1980, and officially established by OPNAV NOTICE 5450 on 28 February 1980.

Captain Channing L. Ewing, MC, USN was the first Officer in Charge of the Laboratory. Commander Robert S. Kennedy, MSC, USN became the Officer in Charge in December of 1976, and was relieved by Captain James E. Wenger, MC, USN in August 1979. Captain Wenger became the first Commanding Officer when the Laboratory was designated a command in August 1980. Captain Loys E. Williams, MC, USN assumed command in 1982 and was relieved by Captain Robert J. Biersner, MSC, USN in August of 1984. Captain Biersner served until April 1987 and was succeeded by Commander Don M. Herron, MSC, USN. Captain Douglas W. Call, MSC, USN became Commanding Officer in May 1987 and was relieved by Commander Robert W. Rendin, MSC, USN, in May 1992.

### *COMMAND RELATIONSHIPS*

NBDL is under the command of Naval Medical Research and Development Command (NMRDC) and receives primary support from the Chief, Bureau of Medicine and Surgery, Washington, DC.

## **NAVAL BIODYNAMICS LABORATORY**

---

### **NBDL MISSION**

**OUR MISSION** is to enhance the performance of and prevent injury to the men and women of the United States Navy and Marine Corps.

**WE WILL ACCOMPLISH** this by conducting biomedical research on the effects of mechanical forces encountered by crew members in Navy/Marine Corps aircraft and ships, establishing human tolerance limits to these forces, and developing approaches to minimize their adverse effects.

**WE WILL STRIVE CONTINUALLY** to conduct the highest quality research to improve the safe and effective performance of Sailors and Marines.

### **NBDL VISION**

**WE ARE COMMITTED** to providing a research facility dedicated to excellence in which:

**THE NAVY AND MARINE CORPS** consider NBDL the first source of scientific information relating to impact acceleration and the effects of ship motion on human performance.

**BIOMEDICAL RESEARCH ORGANIZATIONS** respect the Naval Biodynamics Laboratory as a world leader in conducting biodynamics research.

**OUR LABORATORY PROFESSIONALS** view the Naval Biodynamics Laboratory as a superior environment for realizing their professional growth and satisfaction.

**OUR HIGHER ECHELON COMMAND** regards the Naval Biodynamics Laboratory as the model command supporting the Navy Medical Department's strategic goals and objectives.

**OUR PEOPLE** view themselves as empowered members of one of the world's finest biodynamics research teams.

### **NBDL GUIDING PRINCIPLES**

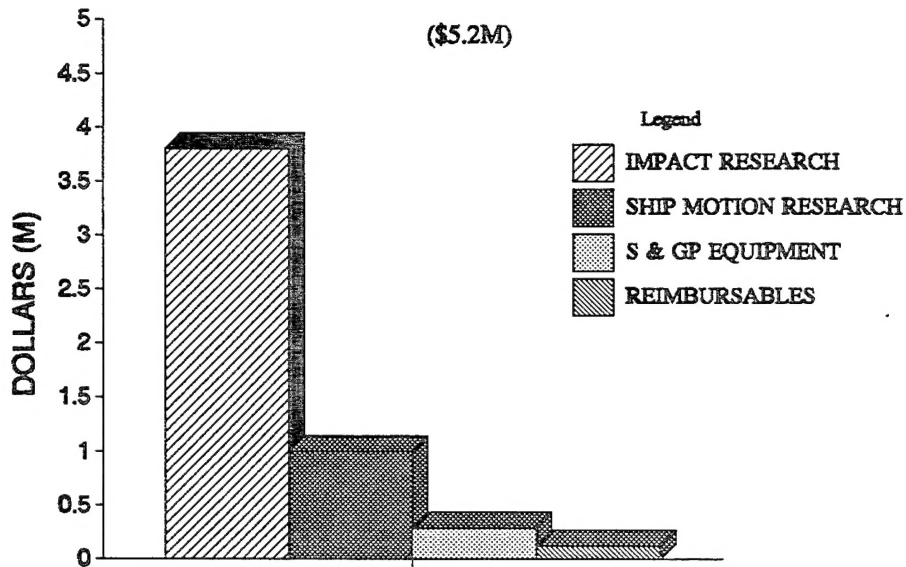
**WE EXIST** to ensure the best performance from and prevent injury to our Sailors and Marines.

**WE WILL** support the combat readiness of the Navy and Marine Corps. Maintain pride and quality in all our work. Earn the trust and confidence of our customers by enthusiastically providing prompt responses to their operational research requirements. Share the results of our research with the international scientific community. Be responsible members of our civilian community by providing civic support whenever possible.

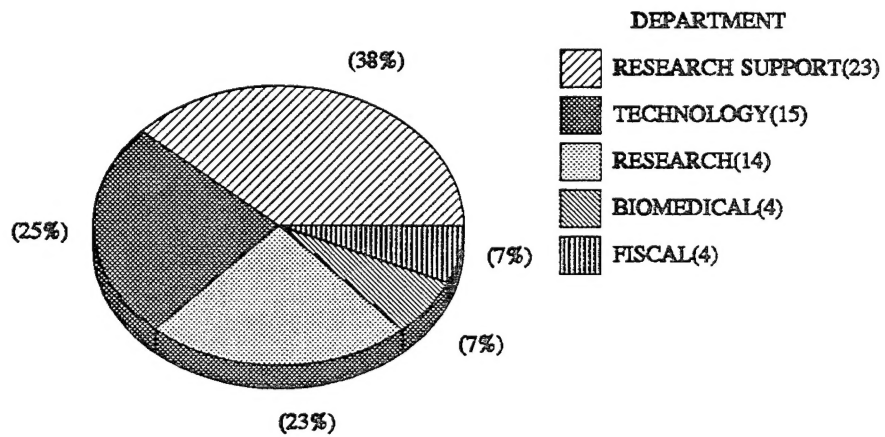
**WE CARE** about each other just as we care about our work. This is the basis of the mutual trust and respect that must exist for us to succeed.

## 1994 Command History

### TOTAL FUNDING

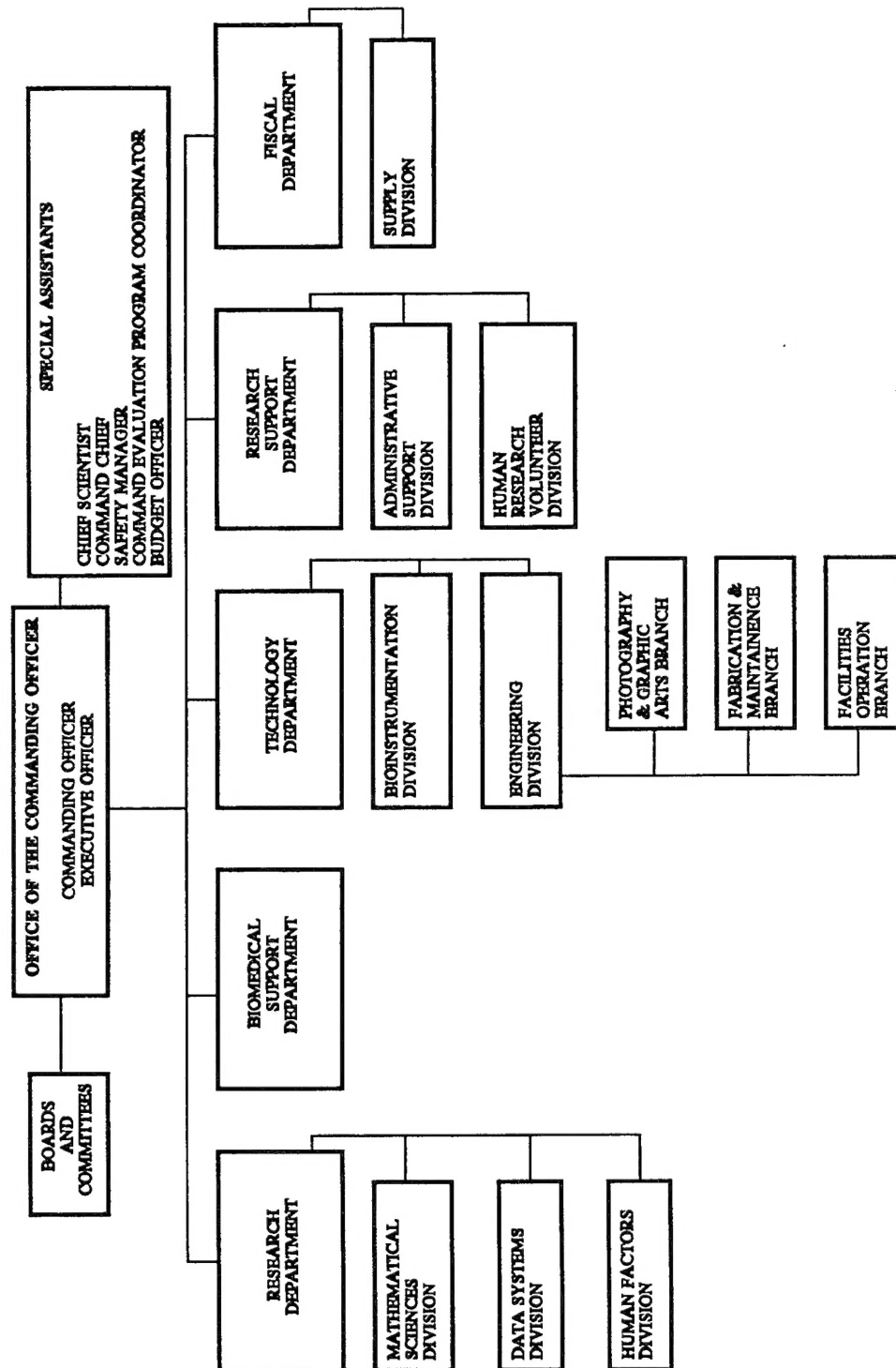


### AVERAGE PERSONNEL STRENGTH



# NAVAL BIODYNAMICS LABORATORY

## ORGANIZATION CHART





**COMMANDING OFFICER**

Commander Robert W. Rendin, Medical Service Corps, United States Navy, was born on 21 October 1949, in Jamaica, NY. He received a bachelor of science degree from Rutgers University, New Brunswick, NJ in 1971.

Following employment as a community health officer in New Jersey, he received a master of science degree in environmental health from East Tennessee State University, Johnson City, TN in 1974. He entered the Navy in September 1974 and completed officer indoctrination training at the Naval School of Health Care Administration, Bethesda, MD. He then received environmental health



**CDR Robert W. Rendin, MSC, USN**

officer training at the Navy Environmental Health and Preventive Medicine Unit #5 in San Diego, CA. He was assigned as Environmental Health Officer at the Naval Regional Medical Center, San Diego, CA; then as Chief, Preventive Medicine Service at the U.S. Naval Hospital Taipei, Taiwan; Chief, Occupational and Preventive Medicine Service at the Naval Regional Medical Center, Great Lakes, IL; Environmental Health Officer on the staff of Commander, Naval Air Force Atlantic Fleet; and as Head, Environmental Health Service at the Navy Environmental and Preventive Medicine Unit #2 in Norfolk, VA. Commander Rendin graduated from the U.S. Marine Corps Command and Staff College, Quantico, VA, 1986, and completed Field Medical Service School at Camp Pendleton, CA. He had following tours as Health Service Support Officer for the First Force Service Support Group, Fleet Marine Force, Pacific; and Medical Administrative Officer at the Headquarters, Fourth Marine Division, New Orleans, LA. In September of 1990, he reported to the Naval Biodynamics Laboratory, New Orleans, LA as Executive Officer. Commander Rendin's military awards include the Meritorious Service Medal, the Navy Commendation Medal (two awards), the Navy Achievement Medal, Meritorious Unit Commendation, National Defense Medal, Navy and Marine Corps Overseas Service Ribbon, and the Combined Service Forces Honorary Insignia (Republic of China). Commander Rendin assumed command of NBDL in May 1992.

**COMMANDING OFFICER'S STATEMENT**

The year 1994 marked a significant turning point in the history of the Naval Biodynamics Laboratory. The indirect impact acceleration data, collected over twenty years of research, is now being used to create a computer model of human response. This finite element model, under development with Tulane University, will predict human

## NAVAL BIODYNAMICS LABORATORY

---

cervical spine tolerance and injury thresholds for given accelerations. It will be the first of its kind in the world, with potential for broad applications in military aviation as well as the automobile industry. In addition, we have made significant progress in preserving our database by transferring experimental runs, through software development, from magnetic tape to CD ROM.

We began recruiting female volunteers exclusively in order to provide a more complete database of human response. Accordingly, considerable effort was made in the redesign of our test platforms to accommodate female research volunteers. A new "unisex" harness system was developed to fit both male and female volunteers engaged in acceleration experiments. This harness will be in use for a newly approved protocol to test  $+G_z$  vertical unhelmeted female response. The series is scheduled to begin in January 1995.

The first NBDL Mobile Laboratory for off site validation of our cognitive training program for preventing motion sickness was built and is being readied for fleet use. This mobile lab will house a three-axis tilting rotating chair for motion sickness desensitization training and research.

Support to the tri-service research community was achieved through cooperative acceleration research with the U.S. Army Aeromedical Research Laboratory. Test device construction was accomplished for the Naval Aerospace Medical Research Laboratory. We continued our cooperative research on Human Performance at Sea with Carderock Division, Naval Surface Warfare Center, and with scientists from Britain, the Netherlands, and Canada. A human factors engineering assessment of the 47 ft motor lifeboat was completed for the U.S. Coast Guard.

Looking toward future research, we are creating improved and increased capabilities. A three dimensional infrared tracking system for measuring the dynamic response of test subjects is under development. Also, a restricted environment simulation tank was constructed and installed in our biophysics laboratory to facilitate the development of a sensory-event related test for motion sickness susceptibility.

As this Command History goes to press, uncertainty about the Lab's future remains a central issue. We continue to respond to both Base Closure and Realignment Commission (BRAC 95) and Research Development and Acquisition (RDA-21) data calls. Despite this uncertainty, we are confident of our ability to conduct the highest quality research and, with our unique equipment and personnel, endure as a true national asset.

*1994 Command History*

---



**CDR L. W. Schoenberg, MSC, USN,  
Executive Officer**



**Dr. Marc S. Weiss,  
Chief Scientist and Head,  
Research Department**



**Mr. Gilbert C. Willems,  
Head, Technology Department**



**LT C. J. Miller, MC, USNR,  
Head, Biomedical Support  
Department**



**LT D. W. Denton, MSC, USNR,  
Administrative Officer and  
Head, Research Support  
Department**



**Ms. Severina Garcia,  
Head, Fiscal Department**



**YNCS S. M. Rogan, USN,  
Command Senior Chief**



## **NAVAL BIODYNAMICS LABORATORY**

---

### **EXECUTIVE OFFICER**

The Executive Officer is responsible to the Commanding Officer for the routine management of the command. All orders originating from the Executive Officer are considered as coming from the Commanding Officer. The Executive Officer serves as the direct line supervisor for the departments, manages and facilitates the editorial review of reports and speeches, and exercises fiscal authority as granted by the Commanding Officer. He assumes overall responsibility for command civilian personnel matters and coordinates the submission of the Command History. The Executive Officer is a member of the Navy Medical Department. He chairs numerous Laboratory boards and committees: Protection of Human Subjects, Credentials Review, Safety, Position Management, Sailor of the Quarter/Year, Civilian of the Quarter, and Information Systems.

### **CHIEF SCIENTIST**

The Chief Scientist (CS) serves as principal advisor to the Commanding Officer on the status, plans, and direction of the command's scientific programs. The CS organizes and maintains program documentation which provides maximum information to the Commanding Officer to assist him in managing long range programs and assure the flexibility to initiate prompt research and development efforts in response to line identified fleet problems. The CS maintains liaison and coordination with the Director of Research and Development at the Naval Medical Research and Development Command. The CS is responsible for internal review and management of all research work unit proposals.

### **COMMAND CHIEF PETTY OFFICER**

The Command Chief Petty Officer assists the Commanding Officer and the Executive Officer in matters pertinent to the morale and welfare of enlisted personnel and their dependents. He performs duties as directed to ensure that policies and programs pertaining to enlisted personnel are disseminated, and maintains open lines of communication between the command and members of the enlisted community.

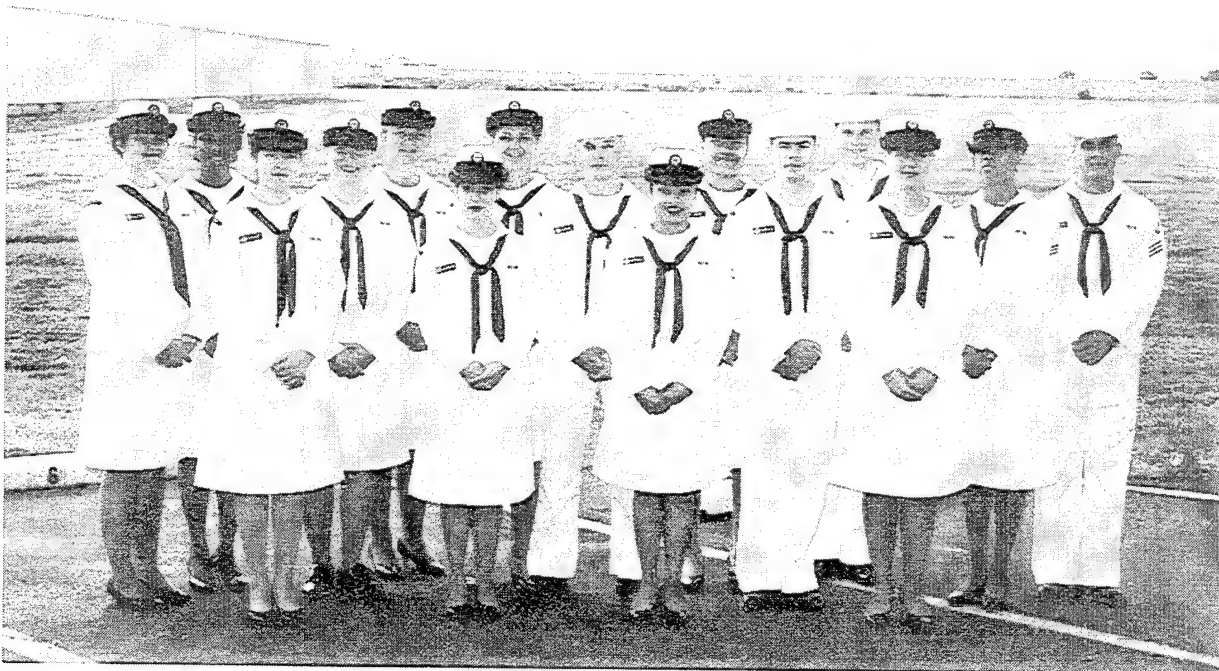
## *1994 Command History*

---

### *Human Research Volunteers*

NBDL has eight billets for Human Research Volunteers (HRVs). HRVs are recruited from the Recruit Training Command in Orlando, Florida and the Great Lakes Recruit Training Command in Chicago, Illinois. All HRVs are junior enlisted personnel who have completed Apprenticeship Training. The normal tour length as an HRV is eighteen months. HRVs must meet rigorous mental and physical standards. NBDL Instruction 3900.1E establishes the safety standards that research projects must meet to utilize HRVs. Every project involving HRVs must be reviewed by the NBDL Committee for the Protection of Human Subjects. The committee reviews experimental protocols and recommends approval, modification or disapproval of the project to the Commanding Officer. Final approval authority is vested in the Surgeon General, Bureau of Medicine and Surgery via the Commanding Officer of NMRDC. The HRVs are followed on a long term basis to determine if there are any lasting performance, physiological or medical effects due to impact acceleration exposure. When not involved as subjects in experiments, the HRVs work in all command departments thus greatly enhancing the efficiency of the Laboratory.

---



**Human Research Volunteers**

## NAVAL BIODYNAMICS LABORATORY

---

### *Facilities*

The Naval Biodynamics Laboratory houses several unique motion devices. Among these are the horizontal accelerator, vertical accelerator, ship motion simulator, and motion desensitization chair and visual drum.

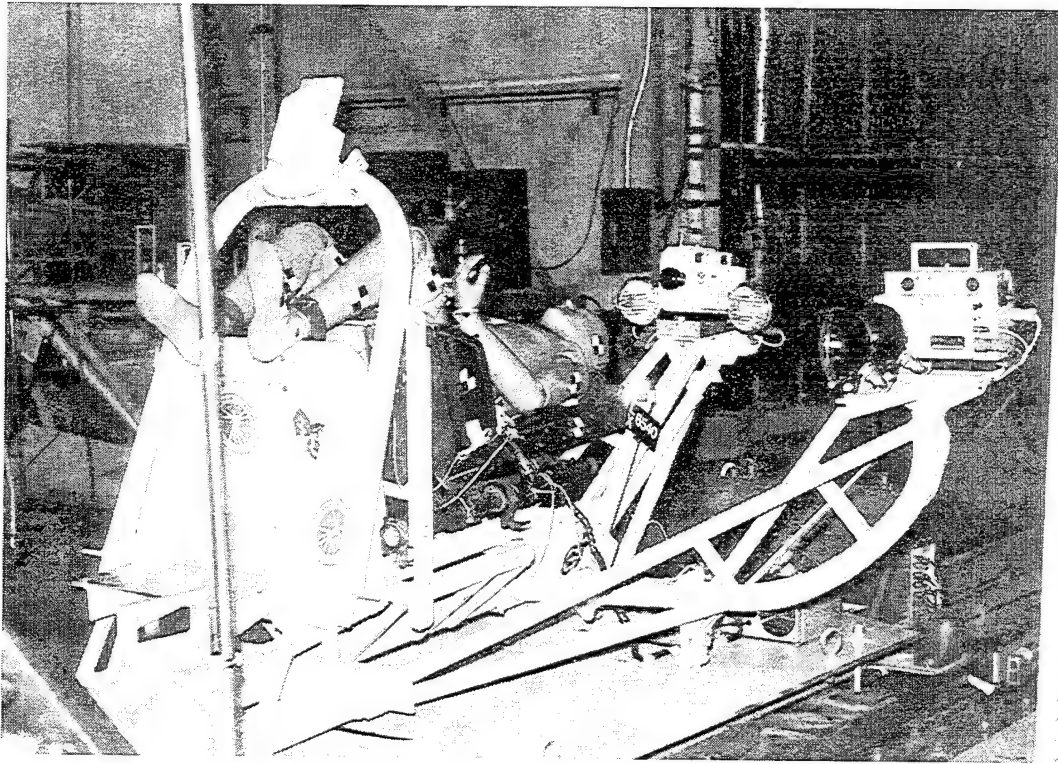
**Horizontal Accelerator.** The command's Impact Research Program is designed to investigate the effects of indirect impact forces on the head and neck, and their potential for producing injury. To achieve this, a 700 foot, enclosed, environmentally controlled horizontal acceleration test track has been in operation at NBDL since 1972. The track incorporates a thrust accelerator with a control console and several sleds. On the horizontal accelerator, the sled is accelerated along the track with a Bendix, 12 inch Hyge system capable of generating 225,000 lbs of thrust. Dry nitrogen, provided by NASA, delivers the needed pressure to trigger the sled. The sled is decelerated by friction forces ranging from 2 to 4 meters per second squared. Two sleds are currently in use, a Z-axis sled and an omni-directional sled capable of rotating 360 degrees. Several important safety systems are in place to protect HRVs, technicians, and equipment. All the safety systems work independently and triggering any one will automatically shut down the system.

HRVs are given non-injurious impact accelerations. During these tests, angular and linear displacements, velocities, and accelerations of selected body segments are measured in three dimensions by man-mounted transducers. Physiological data including somatosensory evoked potentials, electroencephalogram (brain waves), electrocardiogram (muscle recordings) and respiratory patterns are recorded and analyzed. Mechanisms of central nervous system injury have been derived from similarly instrumented primates.

Currently, acceleration data are collected by a Hewlett-Packard 9000/220 computer and analyzed by a Hewlett Packard 9000/835 computer. High speed instrumentation cameras record the motions of HRVs. A computer based photodigitizing system scans the film with automatic pattern recognition algorithms, determines the changing X and Y position of photo targets mounted on the HRV during the acceleration, and writes the results to a magnetic tape. The analysis combines the measured photographic and inertial data with sensor position and alignment, sensor calibration, camera position and alignment, camera optical calibration, photo target position, and standard anatomical coordinate systems based upon X-rays of each HRV. Motion of the HRV is determined independently from photographic and inertial data, and the results are compared for agreement as a final check of data integrity.

*1994 Command History*

---



**Horizontal Accelerator**



## NAVAL BIODYNAMICS LABORATORY

---

**Vertical Accelerator.** The Laboratory studies human response to impact by also using a nitrogen powered vertical accelerator which propels a restrained HRV or manikin on an instrumented carriage along a 42-ft vertical track. The HRVs are initially exposed to low levels of acceleration which are increased in increments of a single "G" within a well established safety range. Before, during, and after each sled run, a physiological data acquisition system is used to collect and analyze physiological measurements and to medically monitor and provide information concerning human response to impact. Although numerous  $+G_z$  (or axial impact) experiments have been conducted on supine HRVs using the horizontal accelerator, the vertical accelerator allows a more realistic investigation of the biomechanical effects of forces similar to those produced by an aircraft ejection seat. Similar to the horizontal accelerator, the vertical accelerator force can be regulated to produce different onset thrusts. The vertical accelerator has also been used to simulate forces encountered aboard Navy ships during underwater explosions.



**Vertical Accelerator**

**Ship Motion Simulator.** A unique device at NBDL is the ship motion simulator (SMS). The SMS is capable of simulating ship motions in weather conditions of up to sea state five with three degrees of freedom - heave, pitch and roll. The SMS is driven by a hydraulically powered piston, the motion of which is controlled by modulating the hydraulic flow via a servovalve-controlled actuator.

The moving system, consisting of the cab and the carriage, is guided along rails attached to a support tower. It carries a double yoke and trunnion system, operated under similar but independent control, that permits roll and pitch motions to be superimposed, singly or in combination, upon the vertical translational (heave) oscillation. The hydraulic power is delivered by a combination of up to four drive pumps located in a separate building.

A 900 gallon-per-minute hydraulic pump provides a heave acceleration of +2.0 g(z) to -0.92 g(z), a velocity of plus or minus 17 feet per second and a displacement of plus or minus 11 feet. A second high pressure, low volume hydraulic pump powers pitch and roll actuators that permit accelerations of plus or minus 150 degrees per second squared for acceleration with a rate of plus or minus 25 degrees per second and a displacement of plus or minus 15 degrees. The descent of the carriage during the heave downstroke is gravitational and limited by friction to approximately 0.9 g. Numerous fail-safe features are in place to prevent the cab and support from falling or crashing including feedback transducers that transmit position information to the control system. Should any of these numerous safety interlocks be triggered, the system automatically shuts down.

Emergency shutdowns can be automatically or manually executed if pumps become overheated, valves become stuck, or system monitors fail. HRVs and researchers also have the capability to shutdown the system by pressing emergency stop buttons located in the motion cab and at the control console.

The SMS is supported by a Zenith/386 microcomputer and a Hewlett-Packard 6942A Microprogrammer. Selected motion data are loaded via the microcomputer into the 6942A format required to drive the SMS. The microcomputer is also used for digitization, storage, and subsequent analysis of motion or other data from the SMS.

A dedicated 14-channel, FM analog tape recorder is available for data collection and/or playback into the SMS. Data are collected via accelerometers and rate sensors which are placed at various points in a ship's hull. The direction of placement determines the type of motion recorded, i.e., heave, pitch or roll. Mathematical formulas can be used to calculate motion effects at any point in the ship. Usually only a portion of the recorded motion is used and it is repeated continuously to create a smooth motion profile. Sinusoidal or simulated at-sea motion synthetic drive signals can also be generated via three dedicated Hewlett-Packard 3314 Arbitrary Function Generators.

The SMS can accommodate a total payload of 5000 pounds, including the moving cab and up to three HRVs. The SMS cab is an 8-ft cube with the forward top edge truncated to accommodate forward pitch motion adjacent to the tower. In its standard configuration, the air-conditioned cab is windowless; however, view ports can be installed if necessary.

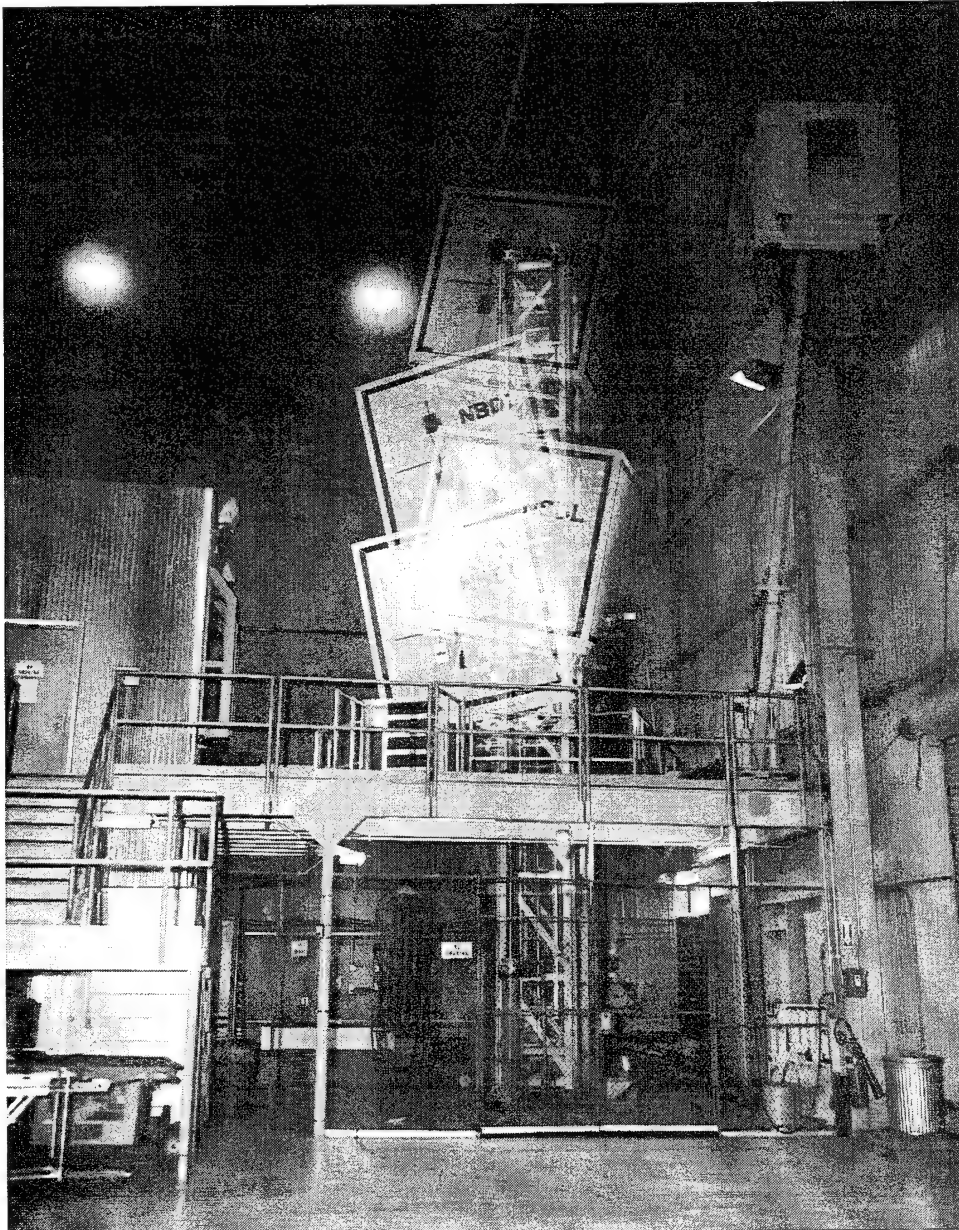
HRVs are continuously observed at the control station by means of closed-circuit TV; two-way communication is conducted via an audio system. The cab can be fitted with up to three forward-facing seats with safety harnesses and with parallel, facing bench type workstations equipped with video display terminals and other performance test

## NAVAL BIODYNAMICS LABORATORY

---

apparatus. HRVs can stop a testing session at any point by activating a safety switch on their console. The cab is also equipped with biomedical instrumentation to monitor: ECG, EEG, respiration, pallor, and other physiological measurements.

In conjunction with the moving cab, a fixed, dimensional replica of the motion cab is available. The static cab's test station is identical in equipment and configuration. The interiors of both have been carefully matched in terms of painting, lighting, air-conditioning, experiment equipment, and other relevant variables. The static cab is frequently used for baseline training and testing prior to testing in the motion cab.

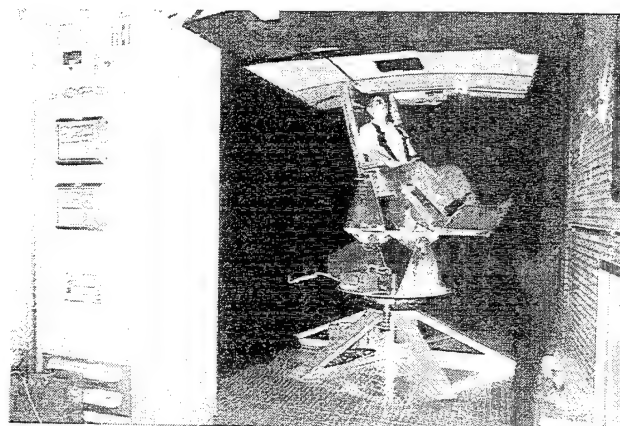


**Ship Motion Simulator**

## 1994 Command History

***Motion Desensitization Chair.*** A three-axis/tilt/rotation chair capable of producing a myriad of motions is used to desensitize subjects to motion environments. This device combined with a cognitive/behavioral training program has been used to successfully treat subjects suffering from intractable motion sickness. In addition to the motion desensitization chair, a visual rotation drum designed to create coriolis stimulation is housed at the University of New Orleans. This device is used in conjunction with the aforementioned cognitive/behavioral training program to alleviate the effects of motion sickness. The program has already returned pilots to active duty who were previously permanently grounded due to chronic motion sickness.

***U.S. Navy Mobile Biodynamics Laboratory.*** The U.S. Navy Mobile Biodynamics Laboratory is a portable platform (trailer containing tilting-rotating chair) for the Cognitive-Behavioral Motion Desensitization Training Program. The 21-foot utility trailer is 8.5 feet wide and 10 feet tall, with a customized center roof which is 12 feet tall. It has independent torsion suspension and tandem axles, with an unloaded weight of 7700 pounds. It contains two air conditioner/heating units and is equipped with a standard two-and-five-eighths inch coupling hitch for towing. Controlled motion exposures are produced by a three-axis tilt-rotation chair assembly, which adds approximately 200 pounds to the trailer. Designed and built by the Naval Biodynamics Laboratory, the chair can tilt independently in the roll and pitch axes while rotating up to 20 revolutions per minute. It is available from the Naval Biodynamics Laboratory as an intervention and management strategy for US Navy and Marine Corps personnel exposed to motion environments. Besides serving as a training platform, the chair assembly also can serve as an ideal site to conduct advanced motion sickness and disorientation studies.



**Mobile Biodynamics Laboratory**



## NAVAL BIODYNAMICS LABORATORY

---

### RESEARCH DEPARTMENT

#### *Department Mission and Functions*

The Research Department designs, plans, conducts, and analyzes all experiments involving impact acceleration and platform motion required to meet program goals and Navy needs and requirements. The Department is responsible for: specifying requirements for biomedical instrumentation and biomedical data; assisting other Departments in evaluating and interpreting analytical, numerical, and statistical data; evaluating physiological and pathological injury models; and critically evaluating protective standards derived from the impact and motion database. The Department has three divisions--Human Factors, Mathematical Sciences, and Data Systems.

### MATHEMATICAL SCIENCES DIVISION

#### *Division Mission and Functions*

The Mathematical Sciences Division (MSD) conducts original scientific work in the area of experimental biodynamic research and mathematical models. MSD develops analytical, numerical and statistical procedures to analyze impact research data.

**Work Unit.** 63216N M0097.001. **"Determination of Human Dynamic, Injury, and Performance Response to Impact Acceleration and Development of Validated Manikin Components."**

**Principal Investigator:** Salvatore J. Guccione, Jr., Ph.D.

**Associate Investigators:** Marc S. Weiss, Ph.D. and Mr. Gilbert C. Willems

The Naval Biodynamics Laboratory is investigating human head and neck response to whole body linear accelerations to further define the dynamic responses of these anatomical segments to impact forces; determine the relationship between the dynamic and physiological responses and injury potential; and to develop validated computer models of human head and neck biodynamic and physiological responses to impact.

**Significant Accomplishments and Research Findings:** Experiments: A series of twenty-one experiments was conducted on the horizontal accelerator in support of a cooperative effort between NBDL and the U.S. Army Aeromedical Research Laboratory (USAARL) at Fort Rucker, AL. The experiments tested the dynamic response and biofidelity of the MIDAS manikin, a Hybrid III with a completely redesigned pelvis and a modified spine. Additionally, three experiments were conducted on the vertical accelerator in support of the MIDAS effort.

Seven experiments in support of proof testing the new unisex restraint harness were conducted on the horizontal accelerator. On the last experiment, the accelerator's load cylinder was damaged, temporarily curtailing the series.

Twenty-five experiments were performed on the vertical accelerator, using various Hybrid III manikins, to: (1) verify that the vertical accelerator operates as before disassembly for safety checking; (2) proof-test a new unisex harness; (3) compare this new

## *1994 Command History*

---

harness with the standard NBDL restraint; and, (4) determine the tracking capabilities of a new high-speed video data acquisition system.

The protocol for the +G<sub>z</sub> vertical unhelmeted female (Unisex Restraint) has been approved by the CPHS. The first impact tests (3g) are slated for Tuesday, 11 January 1995.

**Modeling Efforts:** Four proposals for modeling impact acceleration test data submitted under NBDL's 1994 Broad Agency Announcement have been contracted through the Office of Naval Research (ONR). These modeling efforts are: (1) a state-of-the-art finite element model (FEM) of the human cervical spine to assess the risk of cervical spine injury associated with various simulated operational scenarios, (2) a Kalman filter for optimally combining sensor and photo data acquired during volunteer impact acceleration experiments to reconstruct the head/neck motion and the associated error corridors, (3) a thorough statistical analysis of NBDL's historical impact acceleration test database to clarify which types of operational questions the database can presently answer, and which areas should be addressed by future experimental designs. They are further described below:

### ***"Computational Modeling of Head/Neck Motion Due to Impact Acceleration."***

The objective of this research effort is the development of an anatomically and kinematically correct three-dimensional continuum finite element model of the cervical spine.

If the model is anatomically and kinematically correct, the underlying stresses, strains, etc. in the various tissues will be assumed to be correct. These can then be compared to injury threshold levels for cervical spine tissue contained in the literature or be evaluated by additional experimentation being performed by a subcontractor. (Dr. R. Anderson, Biomedical Engineering Dept., Tulane University)

***"Development of a Methodology for Determining Cervical Spine Injury Probabilities in Impact Acceleration Scenarios."*** The goal of this modeling effort is to assess the probability of injury to the various components of the cervical spine due to various impact acceleration scenarios. These scenarios will simulate the operational environment allowing insights beyond the limits of human volunteer tolerance. This contract is in conjunction with the cervical spine model mentioned above. (Southwest Research Institute, Dr. J. Wu)

***"A Kalman Filter Model for Impact Acceleration Tests."*** The objective of this research effort is the development of a Kalman filter to optimally determine human head/neck kinematics during short duration impact acceleration tests from measured inertial sensor and photographic data. (Electrical Engineering Dept., University of New Orleans)

***"Statistical Research on the NBDL Dynamic Response Database."*** The objective of this research effort is to determine the present status and usefulness of the NBDL database for answering questions involving human head/neck kinematic response to impact acceleration. (Desmatics Inc., Dr. D. Smith)

## NAVAL BIODYNAMICS LABORATORY

---

The goal of this initial effort is a thorough assessment of the quality, consistency and coverage of the present NBDL database.

ECG data from two horizontal accelerator rhesus tests of one hour duration each, were digitized for analysis under contract by Dr. Goldberger at Harvard Medical School.

A transversal linear adaptive filter for evoked potential (EP) latency shift analysis was tested. The results were submitted and accepted for conference presentation at the Institute of Electronic and Electrical Engineering in Medicine and Biology (EMB). Since this method was found unsuitable for use on our somatosensory evoked potential (SEP) data, evaluation of an adaptive delay estimator for EP latency analysis was performed.

The results of this effort at applying least-mean-square(LMS) adaptive filters to the analysis of SEP data were presented at the 16th Annual International Conference of the EMBS meeting on 3-6 November 1994.

### HUMAN FACTORS DIVISION

#### *Division Mission and Functions*

The Human Factors Division designs, conducts, and analyzes experiments on the interactions of human operators and military operational environments, and uses the data generated from these experiments to develop human factors engineering standards and specifications for military systems. The Division also conducts in-house and field projects on motion and its effects on performance, and develops and validates techniques to reduce the adverse effects of motion on humans in the military environment.

The Division is responsible for determining the effects of the inertial environment on the operability of military weapons platforms. It assumes overall responsibility for the operation of the ship motion simulator (SMS) and formulates plans for use of this device. The coordination of air and sea field projects falls under the authority of the Division. The Human Factors Division also performs research in conjunction with other governmental and non-governmental organizations. The Division focuses on identifying the effects of low frequency oscillatory motion on human operator performance in combat systems operations. Areas of special interest are cognitive and psychomotor performance during adverse conditions and biodynamic stress encountered on naval vessels.

*Work Unit.* 63706N M0096.002. **"Protection of Naval Personnel from Motion Sickness and Other Adverse Motion Effects."**

*Principal Investigator:* Daniel L. Dolgin, CDR, MSC, USN

*Associate Investigators:* Mary J. York, LT, MSC, USNR and David L. Matson, Ph.D.

***Significant Accomplishments and Research Findings:*** The first female subjects were used in a study using the ship motion simulator. The American-British-Canadian-Dutch (ABCD) Working Group met at Bedford, England 18-22 April 1994, at Halifax, Canada 08-12 August 1994, and at The Netherlands in October 1994 to discuss progress on the Cognitive Performance Assessment Study which used the NBDL ship motion simulator.

**Cognitive and Psychomotor Performance Study Experimental Runs Completed.** Performance test development and simulation work was delayed due to a gap in the research psychologist billet. A new protocol was prepared and approved to permit using female subjects and to meet the requirement of the revised NMRDC instruction for the SMS experimental runs. Twelve subjects completed static and motion experimental runs which completed the series. Data analysis is currently in process. Preliminary findings showed little or no effect on cognitive and psychomotor performance. A report on cognitive and psychomotor testing is currently in process.

Testing of a revised computer program to control cognitive and psychomotor testing was delayed due to the SMS experimental runs.

**Ship Design Criteria.** Battelle Memorial Institute was contracted to produce a series of products and support data for use by the ship design community. There was a meeting with Battelle and Naval Sea Systems Command representatives to discuss the FY 95 Battelle contract.

**Cognitive-Behavioral Motion Desensitization Training Program (CBMT) Validation.** 115 members from Assault Craft Unit-5, Camp Pendleton, California completed a motion sickness susceptibility survey. Results of the survey suggested finding an alternative community. Assault Craft Unit-4, Little Creek, VA has been contacted and plans for utilizing this community for the validation study are underway.

The U. S. Navy Mobile Biodynamics Laboratory trailer was constructed. This will be used in the Cognitive-Behavioral Motion Desensitization Training Program. The man-rating committee identified several safety concerns including the head clearance of the motion chair within the trailer. Major enhancements to the trailer which will house the 3-axis tilt/rotation chair have been completed to address the safety concerns of the man-rating committee.

**Focus of Attention Study.** The purpose of the study is to test the hypothesis that changes in attention can change susceptibility to motion sickness. Fifteen Navy enlisted personnel assigned to the Naval Biodynamics Laboratory participated in 90 experimental exposures. All subjects completed Phase One and Phase Two. The phases are numbered to correspond to the number of tone types the subjects are to count (low, medium, and high pitch). Their motion-sickness symptomatology changes were assessed using a standardized checklist completed before and after each scheduled exposure. The resultant database was entered into a spreadsheet for analysis. Initial analysis suggests Phase Three will be necessary.

**Electroencephalogram (EEG) Spectrum Feasibility Study.** New equipment, an electrode cap for facilitating EEG data collection, was tested in the ship motion simulator. EEG data collection technique was validated for use in a future SMS experiment.

**Sea Legs Study.** The purpose of the study is to evaluate the process of adapting to a ship motion environment (acquiring "sea legs"). The protocol was revised and submitted to the Committee for the Protection of Human Subjects.

## NAVAL BIODYNAMICS LABORATORY

---

**Restricted Environmental Stimulation Tank Study.** A restricted environmental stimulation tank was constructed to facilitate development of a sensory event-related potentials test of susceptibility to motion sickness. The resultant test will be developed into a technology which can be transferred to any clinic with electroencephalographic equipment.

The Scientific Review Committee approved the protocol and forwarded it to the Committee for the Protection of Human Subjects.

### USCG Reimbursable Work Order P.E. #P4401. "Human Factors Engineering Assessment of U. S. Coast Guard 47-Ft Motor Lifeboat."

*Principal Investigator:* F.D. Holcombe, LCDR, MSC, USN

An inspection of the boat and interviews with operation and training crews resulted in a large amount of data analyzed. Twelve shock trials were successfully completed, and test data and a summary report were provided to the sponsor.

## DATA SYSTEMS DIVISION

### *Division Mission and Functions*

The Data Systems Division specifies, acquires, develops, maintains, and operates systems and procedures used for collecting, reducing, and analyzing data related to the impact and motion research programs.

**Significant Accomplishments and Research Findings:** Data Systems personnel installed various computer systems throughout the Laboratory to enhance its ability to process experimental data. They developed software to transfer data from magnetic tapes to CD ROM; installed a CD ROM device to support data storage of experimental runs; successfully transferred over 700 experimental runs to CD ROM; performed various automated data processing functions to support Fiscal Department in meeting command mission goals; and provided timely automated data processing support to all Laboratory users.



## BIOMEDICAL SUPPORT DEPARTMENT

### *Department Mission and Functions*

The Biomedical Support Department provides professional and technical support for all the command's experiments that use HRVs. The staff diligently monitors the health, safety and well-being of all current HRVs and provides medical long-term follow-up for former participants. The Department selects and schedules the use of HRVs in all experiments as required by the principal investigators.

**Significant Accomplishments and Research Findings:** The Department recruited nine new HRVs and provided long-term medical follow-up to six former volunteers. Medical support to the Vertical Impact Acceleration and Ship Motion projects was provided, with zero injuries and a flawless safety record. HM1 Gail Seaman was awarded Sailor of the Year and SN Christine Sternjacob received Sailor of the Quarter for the command. Hospital Corpsman Kenneth Humphries assumed responsibility from HM1 Seaman, as the senior enlisted medical monitor and command Leading Petty Officer. Seaman Apprentice Connie Castrovinci, a nationally certified Emergency Medical Technician, and SN Mae Purganan, were new additions to the staff. Commander Tom Anderson departed the command for a teaching position with the University of Texas and was replaced by LT Chris Miller. The Department is currently interested in evaluating the possibility of vertebral column disease and cardiac isoenzyme changes after exposure to impact acceleration.



## NAVAL BIODYNAMICS LABORATORY

---

### TECHNOLOGY DEPARTMENT

#### *Department Mission and Functions*

The Technology Department oversees the activities of its two component divisions, Bioinstrumentation and Engineering. The Department provides electrical and mechanical engineering support for experimental requirements as specified by other departments, researchers, and the Chief Scientist. This support consists of mechanical design and fabrication of experimental devices, design and construction of electrical/electronic systems for device motion control, photographic systems, and acquisition of inertial and physiological data. The Department also installs and maintains the Laboratory's personal computer systems and supervises new facility construction and repair or renovation of existing facilities.

### ENGINEERING DIVISION

#### *Division Mission and Functions*

Provides design, operation, and maintenance support for the mechanical facilities and equipment of the Laboratory; operates and maintains linear acceleration systems including initial configuration and construction of sleds, seats, restraint systems, camera mounts, etc.; operates and maintains platform motion facilities; and configures the ship motion simulator and the vibration devices for specific experiments. Develops, adapts, and modifies specialized cameras (such as high speed photometric movie cameras) to specific experimental situations involving high acceleration and oscillatory motion; operates and maintains all high speed and special cameras, documentary cameras, and audiovisual equipment in the Laboratory. Supports Laboratory projects through the operation of well-equipped machine and woodworking shops. Constructs or supervises the construction of new facilities required for the conduct of research. Coordinates engineering functions with the other departments through the Head, Technology Department.

### BIOINSTRUMENTATION DIVISION

#### *Division Mission and Functions*

Provides instrumentation designs for human and human surrogate impact acceleration and platform motion experiments. The Division is responsible for installing, operating, and maintaining complete data acquisition (analog and digital) systems employed in the experiments conducted by the Department, and provides electronic/electrical operation and maintenance support for the Laboratory's experimental devices. It is also responsible for the configuring of field data measuring and acquisition systems for use aboard ships or at other field locations.

***Significant Accomplishments of the Technology Department:*** The Department conducted an experimental test series on both accelerators in support of a cooperative effort between NBDL and the U.S. Army Aeromedical Research Laboratory (USAARL), Ft.

### *1994 Command History*

---

Rucker, Alabama. The purpose of these experiments was to determine the dynamic response of a fully instrumented MIDAS dummy. This is a Hybrid III dummy with a completely redesigned pelvis and a modified spine. The intent of these modifications was to improve biofidelity.

In March, a series of experiments was conducted on the horizontal accelerator to proof test a redesigned "unisex" restraint harness. During one of these tests the accelerator's load cylinder ruptured, causing significant damage to the facility but no serious injuries. Although all of the damage to the facility has been repaired by the Technology Department personnel, the accelerator has been inoperable for the remainder of the year due to the failure of the manufacturer to deliver a replacement cylinder as scheduled. Based on recommendations of the manufacturer and the investigator from the Naval Research Laboratory, new stringent maintenance procedures have been instituted for both accelerators.

A man-rating committee for the mobile motion desensitization chair was convened. The committee issued an extensive list of requirements, one of which consisted of modifying the trailer by raising the roof in the area directly above the chair. All of the requirements were complied with, and the device is expected to be man-rated in early CY 95.

This department executed two reimbursable work units in support of the Naval Aerospace Medical Research Laboratory (NAMRL), Pensacola, Florida. One was the completion of a two-degree-of-freedom (pitch and roll) test device; the other consisted of replacing the shock absorbers of the linear track of NAMRL's Coriolis Acceleration Platform with upgraded ones.

A restricted environment stimulation tank was constructed and installed in the biophysics laboratory to facilitate development of a sensory event-related potentials test of susceptibility to motion sickness.

The Bioinstrumentation Division has been active in cleaning/conditioning the magnetic tapes containing archived physiological data. These procedures should extend the life of the data and allow their transfer to another recording medium. The division also greatly enhanced its instrumentation capability. General purpose equipment funding was used to procure: (1) pulse code modulation tape recorders to replace the present analog inertial data back-up tape recorder; (2) New analog and digital oscilloscopes for data monitoring; (3) State-of-the-art test equipment for design/development/repair of electronic systems used in experiments throughout the Laboratory.

Preliminary tests have been conducted on the vertical accelerator for the validation of the Optotrak® three-dimensional infrared tracking system. Initial analysis indicates that it is feasible to use this system to track the dynamic response of test subjects undergoing vertical impact acceleration.



## **NAVAL BIODYNAMICS LABORATORY**

---

The Technology Department's two divisions provided personnel and equipment to support 244 experiments on NBDL devices as follows:

a. 35 human experiments on the ship motion simulator in support of the cognitive phase of the CANUKUS program.

b. 28 dummy experiments on the horizontal accelerator in support of the NBDL/USAARL program and proof-testing of the "unisex" harness.

c. 44 experiments on the vertical accelerator in support of the following:

- (1) Proof testing of a "unisex" harness.
- (2) Verification that the vertical accelerator operated properly after reassembly following maintenance inspection.
- (3) Determination of the effect of a light weight (115 lbs) dummy on predicted G-levels.
- (4) Determination of Optotrak's ability to track the subject's head during impact.

d. 117 experiments on the motion desensitization chair in support of the Focus-of-Attention program.

## **RESEARCH SUPPORT DEPARTMENT**

### ***Department Mission and Functions***

The Research Support Department provides administrative services and support to all departments of the command, coordinates administrative and clerical support services, provides coordination with other departments concerning administrative and financial matters, maintains and reviews all support agreements and memoranda of understanding, and is responsible for the efficient operation of its divisions.

## **ADMINISTRATIVE SUPPORT DIVISION**

### ***Division Mission and Functions***

Coordinates matters relating to official incoming and outgoing correspondence, reports and messages, and maintains a correspondence control file. Updates and controls the command directives files, and maintains current Navy instructions.

***Significant Accomplishments:*** The Research Support Department made organizational changes which improved efficiency and effectiveness. The Supply Division was relocated to the Fiscal Department and the efficiency review as well as several data calls were accomplished. The new Department Head, LT Danny Denton, MSC, USNR, reported on board 01 August.

## NAVAL BIODYNAMICS LABORATORY

---

### FISCAL DEPARTMENT

#### ***Department Mission and Functions***

Directs formulation, justification, and administration of command fiscal and budgetary management policies, plans and procedures; establishes and enforces "in-house" budget, fiscal, and accounting control policies; coordinates allocation of both direct and reimbursable funds with program managers; Commanding Officer's advisor for payroll management, prepares the budget for submission to higher authority. Monitors financial operations and reports to the Commanding Officer on a continuing basis regarding the financial status of the command. Responsible for: utilizing appropriate guidelines established by Federal Acquisitions Regulations for the procurement of authorized materials and services; provides administrative, technical, and management authorities with factual data which meet NBDL reporting requirements.

***Significant Accomplishments:*** In spite of extreme time constraints, the Fiscal/Supply Department committed, obligated and procured over 5 million dollars consisting of special services, supplies and materials, meeting obligation rates and numerous deadlines set by higher authority. Provided important fiscal information in response to numerous data calls generated by higher authority.

### SUPPLY DIVISION

#### ***Division Mission and Functions***

Uses appropriate sources for the procurement of authorized materials and services; performs material handling and distribution; conducts stock/inventory control and shipping/receiving functions; maintains command plant property/equipment records, manages the in-house plant property and equipment program ensuring that inventory controls are executed.

***Significant Accomplishments:*** The supply division was relocated under the Fiscal Department. The division head was issued TAD orders to Guantanamo Bay, Cuba from September 1994 through April 1995. The purchasing agent was detailed as interim division head. In spite of this sudden loss of manpower, all tasks were carried out expediently.

## *1994 Command History*

---

### **PROFESSIONAL MEETINGS ATTENDED IN 1994**

Anderson, T.G., 65th Annual Meeting of the Aerospace Medical Association, San Antonio, TX, 8-12 May 1994.

Denton, D.W., Contracting Officer's Representative Course (COR), Pensacola, FL, 15-17 November 1994.

Dolgin, D.L., Commercialization of Defense Technologies by Small Businesses, Washington, DC, 21-22 March 1994.

Dolgin, D.L., 65th Annual Meeting of the Aerospace Medical Association, San Antonio, TX, 8-12 May 1994.

Dolgin, D.L., Hosted conference entitled "Technology Innovation and Transfer for Biomedical Applications", Eglin AFB, FL, 28-30 June 1994.

Dolgin, D.L., Office of Strategic Defense (OSD) Federal Laboratory Diversification Meeting, Washington, DC, 15-17 August 1994.

Dolgin, D.L., U.S. Navy representative to NATO Advisory Group for Aerospace Research and Development (AGARD), Aerospace Medical Panel (AMP), Athens, Greece, 3-7 October 1994.

Dolgin, D.L., American British Canadian Dutch (ABCD) Working Group Meeting, Soesterberg, The Netherlands, 19-21 October 1994.

Dolgin, D.L., Naval Aeromedical Problems Course, Pensacola, FL, 6-10 December 1994.

Garcia, S.S., NMRDC Commanding Officer's Conference, Bethesda, MD, 20-23 November 1994.

Guess, J.F., Basic Contract Administration, Vienna, VA, 20-24 June 1994.

Guess, J.F., Intermediate Purchasing Course, Army Logistics Management College (ALMC), Fort Lee, VA, 28 November - 07 December 1994.

Guccione, S.J., Jr., Female Aircrew Accommodation Program, NAWC, Warminster, PA, 11-13 April 1994.

Guccione, S.J., Jr., NATO AGARD/AMP Working Group 21 Meeting, Wright-Patterson AFB, OH 4-6 May 1994.

Guccione, S.J., Jr., Fall Tri-Service Working Group (TWG) Meeting, Fort Rucker, AL, 24-26 October 1994.

## NAVAL BIODYNAMICS LABORATORY

---

Holcombe, F.D., American, Britain, Canadian, Dutch (ABCD) Working Group Meeting, Bedford, England, 18-28 April 1994.

Holcombe, F.D., ABCD Working Group Meeting, Halifax, Canada, 1-11 August 1994.

Holcombe, F.D., ABCD Working Group Meeting, Soesterberg, Netherlands, 16-29 October 1994.

Holcombe, F.D., Applied Behavioral Science Symposium, Colorado Springs 05-10 Apr 1994.

Kaufman, B., 65th Annual Meeting of the Aerospace Medical Association, San Antonio, TX, 8-12 May 1994.

Kaufman, B., Society of Women Engineers National Convention, Pittsburgh, PA, 21-25 June 1994.

Kaufman, B., Methods for Managing Quality Course, New Orleans, LA, 7-17 June 1994.

Kaufman, B., Implementing Total Quality Leadership Course, New Orleans, LA, 19-29 July 1994.

Kaufman, B., Electroencephalographic Society Meeting, Chicago, IL, 15-20 September 1994.

Kaufman, B., 16th Annual International Conference of IEEE Engineering in Medicine & Biology Society, Baltimore, MD, 3-6 November 1994.

Matson, D., 35th Navy Occupation Health and Preventive Medicine Workshop, Virginia Beach, VA, 26 Feb-04 March 1994.

Matson, D., 65th Annual Meeting of the Aerospace Medical Association, San Antonio, TX, 8-12 May 1994.

Matson, D., Object-Oriented Programming with C++, University of New Orleans, 13 June - 18 July 1994.

Matson, D., Windows Programming, Martin Marietta, New Orleans, 19 August 1994.

Matson, D., Electroencephalographic Society Meeting, Chicago, IL, 15-20 September 1994.

Miller, C.J., 65th Annual Meeting of the Aerospace Medical Association, San Antonio, TX, 8-12 May 1994.

Miller, C.J., Neuroradiology Review Conference, Orlando, FL, 30 Oct - 05 Nov 1994.

### *1994 Command History*

---

Miller, C.J., Naval Aeromedical Problems Course, Pensacola, FL, 6-10 December 1994.

Prell, A., 35th Navy Occupation Health and Preventive Medicine Workshop, Virginia Beach, VA, 26 Feb - 04 March 1994.

Rendin, R.W., 35th Navy Occupation Health and Preventive Medicine Workshop, Virginia Beach, VA 26 Feb - 04 March 1994.

Rendin, R.W., 65th Annual Meeting of the Aerospace Medical Association, San Antonio, TX, 8-12 May 1994.

Rendin, R.W., U.S. Navy Surgeon General's Conference, Roston, VA, 01-05 Oct 1994.

Rendin, R.W., NMRDC Commanding Officer's Conference, Bethesda, MD, 20-23 Nov 1994.

Rogan, S.M., NMRDC Commanding Officer's Conference, Bethesda, MD, 20-23 Nov 1994.

Schoenberg, L.W., Fail Safe Meeting, Pensacola, FL, 23-29 Jan 1994.

Schoenberg, L.W., 65th Annual Meeting of the Aerospace Medical Association, San Antonio, TX, 8-12 May 1994.

Seaman, G.M., National Association of Emergency Medical Technicians, Mobile, AL, 06-09 Oct 1994.

Weiss, M., 14th International Technical Conference, Berlin, Germany, 15-29 May 1994.

Weiss, M., 38th STAPP Car Crash Conference, Ft. Lauderdale, FL, 29 Oct - 02 Nov 1994.

Willems, G., Female Aircrew Accommodation Program, NAWC, Warminster, PA, 11-13 April 1994.

Willems, G., 38th STAPP Car Crash Conference, Ft. Lauderdale, FL, 29 Oct - 02 Nov 1994.

York, M., TQL Implementation Course as part of Quality Coordinator training, Little Creek, VA, 26 September - 08 October 1994.

York, M., Command Assessment Team Indoctrination Course and Command Training Team Course, Newport, RI, 17-26 October 1994.

York, M., Aerospace Medical Association Scientific Program Committee meeting, Washington, DC, 1-2 December 1994.

York, M., Naval Aeromedical Problems Course, Pensacola, FL, 6-10 December 1994.

## **NAVAL BIODYNAMICS LABORATORY**

---

### **PRESENTATIONS FOR 1994**

Dolgin, D.L., "A Marketing Plan for the Naval Medical Research and Development Command Laboratory System." Presented to the Naval Medical Research and Development Command, Bethesda, MD, 23 March 1994.

Dolgin, D.L., "Motion Sickness Prevention and Treatment: Clinical and Research Application." Presented to the Association of Naval Aviation, New Orleans, LA, 21 September 1994.

Dolgin, D.L., "Cognitive-Behavioral Motion Desensitization Training and Research at the Naval Biodynamics Laboratory". Presented to the Israeli Naval Medical Institute, Haifa, Israel, 12 October 1994.

Kong, X., Zhu, L., Kaufman, B., and Rog, A., "Adaptive Estimation of Evoked Potential Latency Under Low SNR Condition." Presented to the 16th Annual International Conference of IEEE Engineering in Medicine & Biology Society, Baltimore, MD, 5 November 1994.

Matson, D.L., "Anti-Motion-Sickness Training". Presented to the 35th Navy Occupational Health and Preventive Medicine Workshop, Virginia Beach, VA, 26 Feb-04 Mar 1994. (Poster)

Matson, D.L., "Cognitive-Behavioral Motion Desensitization Training Program." Presented to Operational Medicine Division, U. S. Coast Guard Headquarters, Washington, D.C., 18 April 1994.

Matson, D.L., "The Motion Sickness Symptomatology Checklist." Presented to the 64th Annual Scientific Meeting of the Aerospace Medical Association, San Antonio, TX, 09 May 1994.

Matson, D.L., "The Effects of Ship Motion on Energy Expenditure during Standing and Walking Tasks." Presented to the 64th Annual Scientific Meeting of the Aerospace Medical Association, San Antonio, TX, 09 May 1994.

Prell, A.M., "Photo Documentation of Impact Acceleration Experiments Involving Manikins and Human Research Volunteers." Presented to the 35th Navy Occupational Health and Preventive Medicine Workshop, Virginia Beach, VA, 26 Feb-04 Mar 1994. (Poster)

Rog, A. & Kaufman, B., "Application of LMS Adaptive Filters to Signal Estimation for Tracking Latency Changes in Short Latency Somatosensory Evoked Potentials." Presented to the 16th Annual International Conference of IEEE Engineering in Medicine & Biology Society, Baltimore, MD, 5 November 1994.

## 1994 Command History

---

### 1994 PUBLICATIONS

Bibliography of Scientific Publications of the Naval Biodynamics Laboratory: 1980-1992.  
Naval Biodynamics Laboratory Report 93R001, July, 1993.

Conwell, S. & Holcombe, F.D., "*The Motion Sickness Symptomatology Checklist*" (abstract).  
Aviation, Space and Environmental Medicine, 65(5).

Matson, D.L., Kaufman, B., Holcombe, F.D., & Conwell, S., "*The Effects of Ship Motion on Energy Expenditure during Standing and Walking Tasks*" (abstract). Aviation, Space and Environmental Medicine, 65(5).

Dobie, T.G., and May, J.G., "*Cognitive-Behavioral Management of Motion Sickness.*"  
Aviation Space & Environmental Medicine, 65(10,Suppl.), C1-C20.

Holcombe, F.D., "*A Taxonomic Approach to Forecasting Military Performance Under Stress.*" Proceedings: Applied Behavioral Sciences Symposium, U. S. Air Force Academy, Colorado Springs, CO, April, 1994.

Kong, X., Zhu, L., Kaufman, B., and Rog, A., "*Adaptive Estimation of Evoked Potential Latency Under Low SNR Condition*", Proceedings of the 16th Annual International Conference of IEEE Engineering in Medicine & Biology Society, Baltimore, MD, 5 November, 1994.

Rog, A. & Kaufman, B., "*Application of LMS Adaptive Filters to Signal Estimation for Tracking Latency Changes in Short Latency Somatosensory Evoked Potentials.*" Proceedings of the 16th Annual International Conference of IEEE Engineering in Medicine & Biology Society, Baltimore, MD, 5 November, 1994.

Willems, G., Plank, G. R., "*Calibration of a Six-Degree-of-Freedom Acceleration Measurement Device (Final Report)*", NTIS Monitoring Agency Report No. DOT-HS-808-189, Performing Organization Report No. DOT-VNTSC-NHTSA-91-2, Volpe National Transportation Systems Center and Naval Biodynamics Laboratory, December, 1994.



## **NAVAL BIODYNAMICS LABORATORY**

---

### **DISTINGUISHED VISITORS IN 1994**

Dr. Nabih Alem	USAARL, Ft. Rucker, AL
Dr. Kumar Amaraneni	Louisiana State University, Baton Rouge, LA
Mr. Chris Anderson	Environmental Textronics Corporation, Orlando, FL
Dr. Ron Anderson	Tulane University, New Orleans, LA
Dr. Richard Baratta	Louisiana State University, Baton Rouge, LA
Dr. Stella Batalama	University of New Orleans, New Orleans, LA
Mr. Sedric Beachem	Naval Medical Research and Development Command, Bethesda, MD
Dr. Roger Beuerman	Louisiana State University, Baton Rouge, LA
Dr. Martha Bidez	University of Alabama, Tuscaloosa, AL
LT Sean Biggerstaff	Naval Aerospace Operational Medical Institute, Pensacola, FL
Ms. Sherri Blackwell	Wright Patterson Air Force Base, Dayton, OH
LCDR D. E. Buchanan	Naval Support Activity, New Orleans, LA
Mr. John Cecillo	Naval Facilities Engineering Service Center, Washington D.C.
Dr. Paul Chulian	University of New Orleans, New Orleans, LA
Dr. David Colvin	Triangle Research and Development Corporation, Research Triangle Park, NC
Dr. John Crisp	University of New Orleans, New Orleans, LA
Dr. Craig Dorman, (RADM USN, Ret.)	Defense Research and Engineering, Washington D.C.
Dr. Russ Eberhart	Research Triangle Institute, Research Triangle Park, NC
C. Ewing M.D.	Snell Memorial Foundation, New Orleans, LA
Dr. Bruce Fisch	Louisiana State University, Baton Rouge, LA
Mr. Paul George	University of Alabama, Tuscaloosa, AL

### *1994 Command History*

---

CDR S. F. Hansen	Commander, Naval Air Reserve Force, New Orleans, LA
Dr. Gerald Harris	Marquette University, Milwaukee, WI
Dr. Richard Hart	Tulane University, New Orleans, LA
LCDR S. L. Hayes	Naval Medical Research and Development Command, Bethesda, MD
Mr. Jim Jackson	Battelle Memorial Institute, Columbus, OH
Mr. Kip Johnson	Naval Medical Research and Development Command, Bethesda, MD
CAPT T. N. Jones	Naval Medical Research and Development Command, Bethesda, MD
JO3 Mark Kane	Navy/Marine Corps News, Washington D.C.
Mr. Eph Konigsberg	Konigsberg Instruments, Research Triangle Park, NC
Dr. Lisa Leonard	Louisiana State University, Baton Rouge, LA
Dr. Myer Leonard	University of Minnesota, Minneapolis, MN
Dr. Xiaorong Li	University of New Orleans, New Orleans, LA
Mr. Joseph Lloyd	Naval Aerospace Medical Research Laboratory, Pensacola, FL
Kevin Mason M.D.	U.S. Army Aeromedical Research Laboratory, Ft. Rucker, AL
Ms. Marta Martinez	Tulane University, New Orleans, LA
Mr. Efrain Molina	Naval Aerospace Medical Research Laboratory, Pensacola, FL
Mr. William Muzzy	ARRCA, Philadelphia, PA
Mr. Arthur Nelson	Naval Aerospace Medical Research Laboratory, Pensacola, FL
Dr. Robert Newburgh	Office of Naval Research, Washington D.C.
Dr. Jaime Nino	University of New Orleans, New Orleans, LA
Dr. Louise Obergefell	Wright-Patterson Air Force Base, Dayton, OH
Dr. Gregory O'Brien	University of New Orleans, New Orleans, LA

## NAVAL BIODYNAMICS LABORATORY

---

Dr. Charles Parkins	Louisiana State University, Baton Rouge, LA
CAPT Jerry Patee	Naval Aerospace Medical Research Laboratory, Pensacola, FL
Dr. Warren Plauche	Louisiana State University, Baton Rouge, LA
Mr. Brad Probst	Tulane University, New Orleans, LA
LCDR Chris Real	OPNAV, CNO, Washington D.C.
LT Kelvin Richardson	Louisiana State University, Baton Rouge, LA
CDR Angus Rupert	Naval Aerospace Medical Research Laboratory, Pensacola, FL
Dr. Avi Shupak	Israeli Naval Medical Institute, Haifa, Israel
CDR Tim Singer	Naval Medical Research and Development Command, Bethesda, MD
Dr. Dennis Smith	Desmatics Inc., College State, PA
Dr. Ben Thacker	Southwest Research Institute, San Antonio, TX
Dr. Jan Thunnissen	TNO Industrial Research Delft, The Netherlands
Dr. Louis Tigerina	Battelle Memorial Institute, Columbus, OH
Ms. Crina Tornow	Battelle Memorial Institute, Columbus, OH
Dr. Russel Trahan	University of New Orleans, New Orleans, LA
Dr. Keith Vanmeter	Louisiana State University, Baton Rouge, LA
Ms. Emily Varnell	Louisiana State University, Baton Rouge, LA
Dr. Terry Watkins	University of New Orleans, New Orleans, LA
CAPT P.K. Weathersby	Naval Submarine Medical Research Laboratory, Groton, CT
LCDR Schyler Webb	Naval Military Personnel Command
Dr. Phil Whitley	Naval Air Warfare Center, Warminster, PA
Dr. Justin Wu	Southwest Research Institute, San Antonio, TX Washington D.C.

## **COMMUNITY SERVICE**

### **PARTNERSHIP IN EDUCATION**

In 1988, a partnership in education was formed between Henry C. Schaumburg School (an Orleans Parish Elementary School) and Naval Biodynamics Laboratory as part of the Chief of Naval Operations' Partnership In Education Program. Two-thirds of the Laboratory's military personnel participate in various endeavors including: weekly one-on-one tutoring of 10 students in reading, mathematics, science, and social studies which resulted in improved academic grades, standardized test scores and study skills, staffing special school events and the Spring Festival and arranging tours of visiting United States Navy ships. Our sailors provide strong role models from varied cultural backgrounds and instill in the students a concern for their school, community, and nation.

For the Laboratory, the Partnership in Education Program has provided an avenue for its youngest staff members to gain personal insight and self esteem.

### **1994 TOYS FOR TOTS CAMPAIGN**

The 1994 "Toys for Tots" campaign was a great success at NBDL. It matched last year's effort which was the most successful donation in the history of NBDL. Coordinating this successful campaign was SN Christine Sternjacob. GySgt Pablo Martinez, representing the U.S. Marine Corps Reserve, graciously accepted NBDL's contributions to the needy children of the New Orleans area.

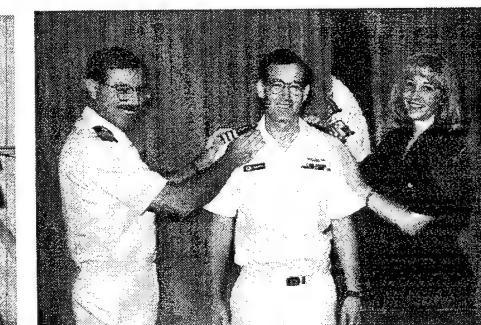
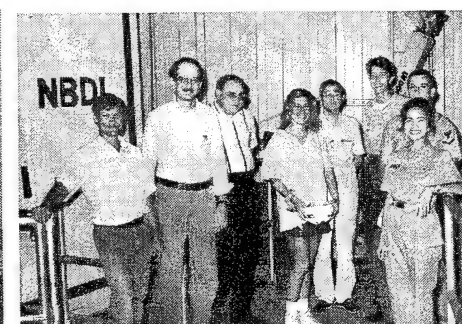
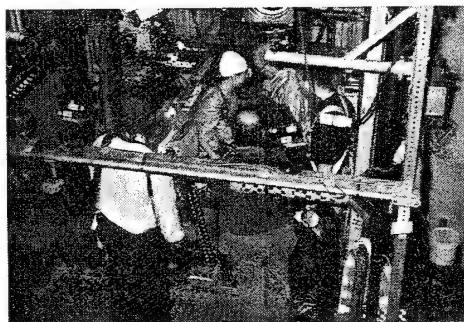
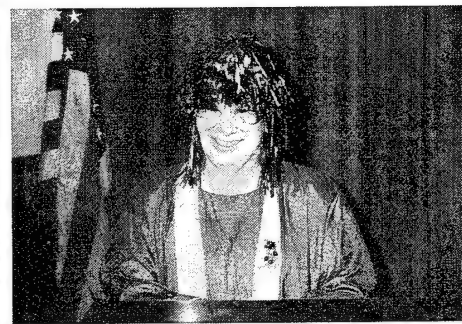
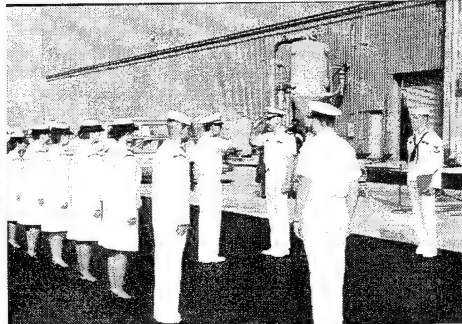
### **OTHER COMMUNITY SERVICE PROGRAMS**

NBDL has participated and contributed to a variety of other community service programs, including:

- \* **Louisiana (Jefferson Parish) Special Olympics**
- \* **Navy and Marine Corps Relief Society**
- \* **Combined Federal Campaign**
- \* **Blood Donations**
- \* **Food Drive for the Needy**

## NAVAL BIODYNAMICS LABORATORY

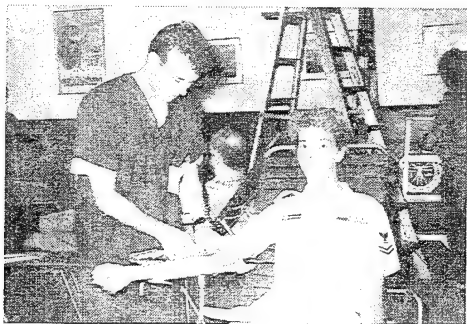
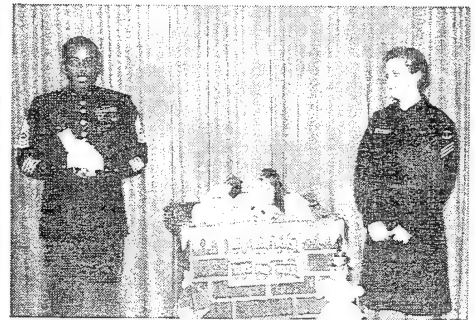
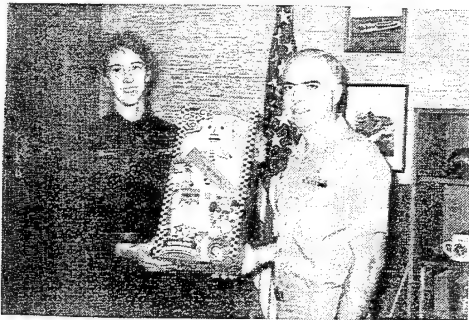
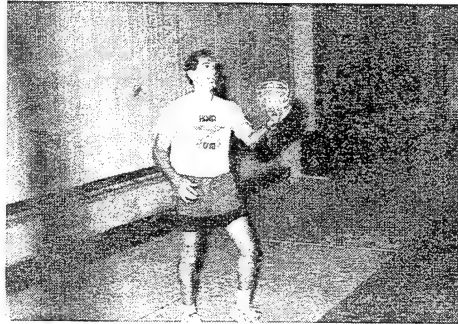
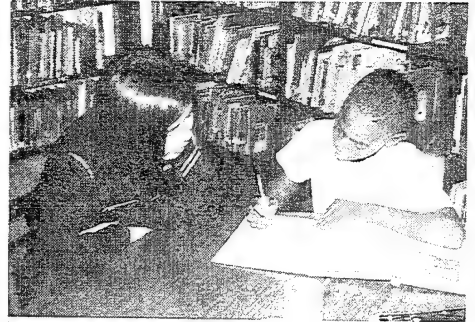
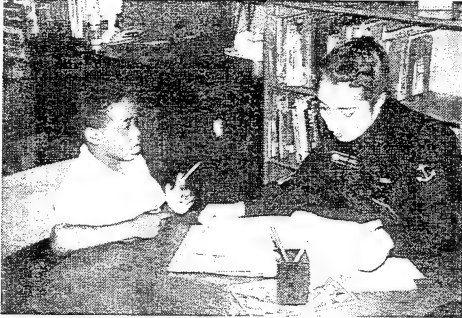
### NBDL PERSONNEL IN ACTION





*1994 Command History*

**NBDL PERSONNEL IN ACTION**





## **NAVAL BIODYNAMICS LABORATORY**

---

### **MILITARY AWARDS**

#### **SAILOR OF THE YEAR 1994**



HM2 Gail M. Seaman, USN

#### **SAILORS OF THE QUARTER 1994**

##### **1994**

YN3 Monica White	Jan - Mar 1994
SN Andrea Griffin	Apr - Jun 1994
SN Christine Sternjacob	Jul - Sep 1994
YN3 Melissa Coleman	Oct - Dec 1994

*1994 Command History*

---

**OTHER MILITARY AWARDS FOR 1994**

**Navy Achievement Medal**

LT Sharon L. Conwell  
LT Kevin Rice  
YN3 Curtis McDonald  
SN Andrea Griffin  
SN Claudia Vargas

**Meritorious Service Medal**

LCDR Forrest D. Holcombe

**Navy Commendation Medal**

LT Danny W. Denton  
HM1 Brooke C. Tartaglia

**Letters of Appreciation**

SR Patrick Baker  
SR Connie Castrovinci  
SN Melissa Coleman  
SN Jorge Colon  
SN Bruce Davis  
SN Enrique Dedios Jr.  
FN Tina Eakin  
BMSN Scarlet Fisher  
SR Leisha Griffin  
AN Grover Hill  
SA Erica Murillo  
YNCS Stephen Rogan  
SA Shekita Sams  
HM2 Gail Seaman  
AN Linton Strawder  
SN Aileen Tran  
YN3 Monica White

**Letters of Commendation**

SN Jorge Colon  
BMSN Scarlet Fisher  
SK2 Anthony George  
HM3 Kenneth Humphries  
HM1 Brooke Tartaglia  
HM2 George Taylor  
SN Claudia Vargas  
YN3 Monica White

**OUTSTANDING PERFORMANCE IN PHYSICAL READINESS PROGRAM**

**1994**

AA Jonie Selby  
CDR Robert Rending  
SN Andrea Griffin  
GSM3 Tina Eakin

LT Danny Denton  
CDR Daniel Dolgin  
SA Connie Castrovinci  
SK2 Clyde Prewitt

## **NAVAL BIODYNAMICS LABORATORY**

---

### **CIVILIAN AWARDS IN 1994**

#### **Civilians of the Quarter 1994**

**1994**

Dexter Walton	Apr-Jun 1994
June Gordon	Jul-Sep 1994
David Knouse	Oct-Dec 1994

#### **Letters of Commendation**

Ms. Connie Dummitt  
Ms. June Gordon  
Mr. Dave Knouse  
Mr. Dexter Walton

*1994 Command History*

---

**MILITARY AND CIVILIANS REPORTING/DEPARTING IN 1994**

**Military Reporting**

SR Ruby Arellano  
SR Patrick Baker  
SR Connie Castrovinci  
SN Deborah Davis  
LT Danny Denton  
CDR Daniel Dolgin  
SR Barbara Dorrough  
SR Leisha Griffin  
SR Kimberly Grist  
SA Thelma Messina

LT Christopher Miller  
SN Mae Purganan  
SR Erica Rule  
AA Joanie Selby  
SN Christine Sternjacob  
AR Kari Trommelen  
LT Mary York

**Military Departing**

SA Jorge Colon  
GSM3 Daniel Demille  
SA Laura Eaton  
SR John Faulkner  
SA Adam Felder  
FN Scarlett Fisher  
SR Cassie Gere  
SN Andrea Griffin  
FR Luz Leon-Hernandez  
CDR Forrest Holcombe  
YN3 Curtis McDonald  
AN Frederick Shuttters  
SA Claudia Vargas  
SA Shekita Weaver  
YN3 Monica White

**CIVILIANS REPORTING/DEPARTING**

**Reporting**

None

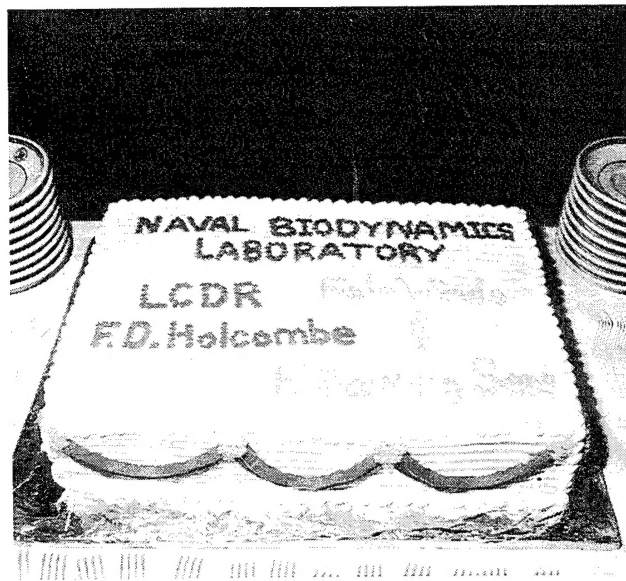
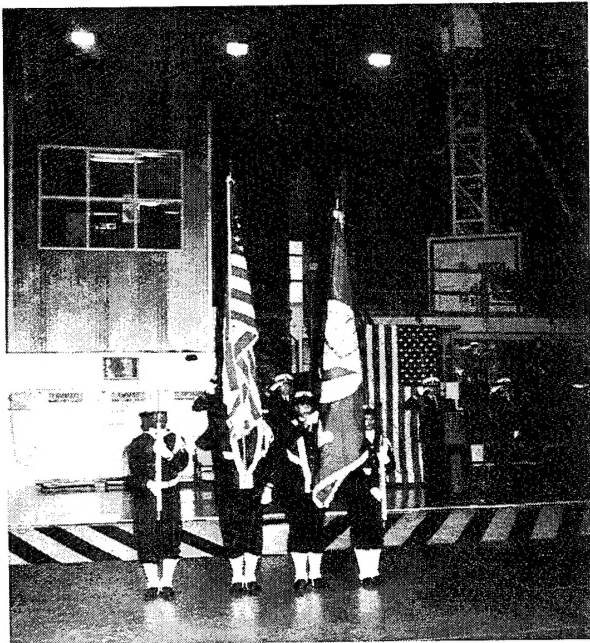
**Departing**

Ms. Connie Dummit

## NAVAL BIODYNAMICS LABORATORY

### NBDL BIDS FAREWELL TO LCDR HOLCOMBE

On 27 October 1994 LCDR Forrest Holcombe retired after 20 years of service. LCDR Holcombe was Principal Investigator for the U.S. Navy's Ship Motion Research Program and was instrumental in forging a coalition of scientists and naval engineers from the United States, United Kingdom, Canada, and the Netherlands into a NATO Working Group on Human Performance at Sea. LCDR Holcombe and his wife, Dr. Sharon Holcombe, moved to Lubbock, Texas where he is Professor of Business and MBA Program Director at Wayland Baptist University.



## ***1994 Command History***

P. O. Box 29407  
New Orleans, LA 70189-0407  
Commercial (504) 257-3919, DSN 485-2297  
Tele FAX (504) 257-5456

### **TELEPHONE DIRECTORY**

#### **OFFICE OF THE COMMANDING OFFICER**

CDR R. W. Rendin	Commanding Officer	257-3917
CDR L. W. Schoenberg	Executive Officer	257-3922
YNCS S. M. Rogan	Command Senior Chief	257-3921

#### **RESEARCH DEPARTMENT**

Marc Weiss, Ph.D.	Department Head/Chief Scientist	257-3979
Salvadore Guccione, Ph.D.	Head, Math. Sciences Division	257-3975
CDR Daniel Dolgin	Head, Human Factors Division	257-3944
Mr. Gary Jupiter	Head, Data Systems Division	257-3938

#### **BIOMEDICAL SUPPORT DEPARTMENT**

LT C. J. Miller	Department Head	257-3953
-----------------	-----------------	----------

#### **TECHNOLOGY DEPARTMENT**

Mr. Gilbert Willems	Department Head	257-3892
Mr. Mark Lotz	Head, Bioinstrumentation Division	257-3900

#### **RESEARCH SUPPORT DEPARTMENT**

LT D. W. Denton	Department Head/Administrative Officer	257-3920
YN3 M. Coleman	Head, Admin. Supp. Div.	257-5479

#### **FISCAL DEPARTMENT**

Ms. Severina Garcia	Department Head	257-0030
SK2 C. Prewitt	Head, Supply Division	257-3960



REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204 Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.				
1. AGENCY USE ONLY (Leave Blank)		2. REPORT DATE March 1995	3. REPORT TYPE AND DATES COVERED Final: 1 Jan 94 - 31 Dec 94	
4. TITLE AND SUBTITLE 1994 Command History Naval Biodynamics Laboratory			5. FUNDING NUMBERS	
6. AUTHOR(S) D. W. Denton, Editor				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Biodynamics Laboratory P.O.Box 29407 New Orleans, LA 70189-0407			8. PERFORMING ORGANIZATION REPORT NUMBER NBDL-95R003	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Naval Medical Research and Development Command National Naval Medical Center Building 1, Tower 12 Bethesda, MD 20889-5044			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release: distribution is unlimited.			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) This report describes the mission of the Naval Biodynamics Laboratory for the calendar year of 1994. Included is information about the command's funding, personnel, organizational structure, each Department, presentations publications, and awards presented.				
14. SUBJECT TERMS MISSION: Impact acceleration; ship motion; evoked potentials; human factors; personnel; funding; test devices.			15. NUMBER OF PAGES 43	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED	20. LIMITATION OF ABSTRACT	